

Intensive Insulin Management

- ❖ Candidates for Intensive Insulin Management must be motivated to improve glucose control and be able to assume responsibility for their day-to-day care.
- ❖ Use of Intensive Insulin Management should be initiated, monitored, and supported by a Comprehensive Diabetes Team.
- ❖ Aggressive management of glycemic treatment goals with insulin may reduce morbidity in patients with severe acute illness, following myocardial infarction, and in pregnancy to improve patient outcomes.
- ❖ Intensive Insulin Management is essential during pregnancy.
- ❖ The challenge of treating type 1 diabetes is to mimic physiologic insulin action. New insulins and new insulin delivery devices allow better basal and bolus insulin replacement than ever before.

What is Intensive Insulin Management?

Intensive Insulin Management is the strategy of making multiple adjustments in insulin dosage each day in order to achieve better glucose control with less hypoglycemia, less hyperglycemia, and more lifestyle flexibility. This strategy is used primarily by people with type 1 diabetes and is often the only means of achieving an ideal level of glucose control without excessive and unsafe episodes of hypoglycemia.

The major emphasis is on making frequent adjustments in short-acting insulin dosages with regular insulin, lispro insulin (Humalog), glulisine, or insulin aspart (Novalog). The dosage is typically altered based on the pre-meal blood glucose level, carbohydrate content of the meal, and sometimes also the anticipated level of physical activity. It is the preferred method of insulin dosing for most patients with type 1 diabetes and can be tailored to fit almost any lifestyle. The two types of insulin delivery for intensive insulin therapy are continuous subcutaneous insulin infusion (CSII) or an insulin pump, and multiple daily injections (MDI).

How is this different from conventional insulin management?

Conventional insulin regimens usually consist of only two insulin injections per day using a mixture of short-acting and intermediate-acting insulins (such as regular and NPH). The dose is usually identical every day, and requires patients to be very consistent about meal times, meal content, timing, and level of any strenuous activity. The use of a sliding scale is also considered conventional insulin management, as it reacts only to the current blood glucose level.

Conventional insulin management rarely allows achievement of A1C goals, and requires the patient's lifestyle to revolve around his or her insulin schedule.

Learning how to adopt an Intensive Insulin Management plan is complex and ideally involves the instruction and support of a comprehensive diabetes team. This team often includes the following:

- ❖ Registered dietician, skilled in the teaching of carbohydrate counting, to accurately estimate meal content.
- ❖ Diabetes nurse educator who can instruct patients in proper self-monitoring of blood glucose, insulin administration, and other techniques.
- ❖ Endocrinologist or other physician skilled in the use and adjustment of intensive insulin regimens utilizing various combinations of insulin types, timing, and delivery devices such as insulin pumps.

What are some examples of Intensive Insulin Management?

The following are some examples of some common intensive insulin regimens.

Continuous Subcutaneous Insulin Infusion (CSII)

Patients utilizing this insulin strategy use a continuous subcutaneous insulin infusion pump worn 24 hours per day (it can be disconnected for short periods of time such as bathing).

- ❖ Utilization of exclusively rapid-acting insulin such as lispro insulin or insulin aspart.

Multiple Daily Injections (MDI)

This regimen consists of multiple injections of insulin, three or four times per day, using a combination of short-acting and either long-acting or intermediate-acting insulin. Two typical therapeutic regimes are:

- ❖ Glargine insulin (Lantus) or detemir insulin (Levemir) at bedtime or in the morning as a fixed dose in combination with lispro insulin, insulin aspart, Glulisine (Apidra), or regular insulin before each meal (variable dose as described above).
- ❖ NPH insulin at bedtime and in the morning as a fixed dose in combination with lispro insulin, insulin aspart, or Apidra insulin before each meal (variable dose as described above).

What are the benefits of insulin pump (CSII) therapy versus multiple daily injections (MDI)?

There are several reasons people with diabetes may find an insulin pump provides better outcomes and more lifestyle flexibility than multiple daily injections. Frequently reported benefits include:

- ❖ Less variation in insulin absorption (about 3 percent versus 25 percent) due to exclusive use of rapid acting insulin, single injection site, and eliminating subcutaneous depot of insulin.
- ❖ Fewer insulin injections (the subcutaneous catheter is replaced every two or three days rather than three to four injections each day).
- ❖ Can be programmed to more closely mimic normal pancreatic insulin secretion patterns (to accommodate working variable shifts, physical activity, nocturnal hypoglycemia, the “dawn phenomenon,” unpredictable lifestyle, high fat meals, etc.).
- ❖ The pump assists with calculation of insulin doses based on carbohydrates ingested and on the blood sugar.
- ❖ It can deliver insulin boluses accurately in 1/10 unit increments (rather than one or two unit increments as with conventional injections). This is particularly important in very insulin sensitive patients including young children.

What are the drawbacks to intensive therapy?

Highly motivated patients are able to overcome many of these problems and achieve success. However, there are drawbacks/limitations to intensive therapy including, but not limited to the following:

- ❖ A high learning curve is associated with pump therapy and continuous glucose monitoring.
- ❖ Individuals must be committed to adapt to use of the pump, frequent blood glucose testing, additional injections of insulin, and time to complete required cares.
- ❖ Many physicians and other healthcare providers are unfamiliar with pump therapy and may not be able to provide the necessary educational support to the patient.
- ❖ Technical equipment failure may occur.

- ❖ There is an increased risk of ketosis when only rapid-acting or short-acting insulin is used.
- ❖ Skin irritation or infections may occur at the needle insertion sites. Frequent site changes are required.
- ❖ Expenses associated with intensive therapy may not be covered by insurance, and will incur additional out-of-pocket expenses.
- ❖ Hypoglycemia may occur as a result of aggressive therapy.

What role does intensive therapy play in type 2 diabetes?

Through the natural disease progression of type 2 diabetes, the resultant loss of beta-cell function eventually leads to the initiation of insulin therapy. A number of different regimens have been studied and are currently available for use in type 2 diabetes to improve 24-hour glycemic control. Recent studies (DCCT and UKPDS) have shown that intensive therapy improves patient outcomes by reducing microvascular complications and reduced mortality rates of diabetes-related deaths.

New recommendations from the American Diabetes Association encourage early use of insulin in patients with type 2 diabetes. Previous insulin therapy was limited to NPH, lente, and ultra-lente insulin before the introduction of insulin analogs. Three rapid-acting insulin analogs—insulin lispro, insulin aspart, and apidra, along with two long-acting insulin analogs—insulin glargine and insulin detemir, are available and demonstrate consistent abilities to obtain target glucose levels and have a lower rate of hypoglycemia than NPH and regular insulin.

Is intensive insulin therapy feasible or appropriate for all patients?

As with any therapy, there are people for whom intensive insulin therapy is not a practical or appropriate strategy. This may include patients with limited insight and judgment, those who cannot do accurate self-monitoring of blood glucose or estimate carbohydrate content, and patients who are not likely to benefit from improved glucose control. Intensive insulin therapy may be unsafe in patients with hypoglycemia unawareness. In the DCCT, the most common side effects of intensive therapy were a three-fold increase in severe hypoglycemic reactions and weight gain. Many patients with type 2 diabetes are less prone to hypoglycemia and can achieve good glycemic control on less intensive insulin regimens.

A caveat to the increased incidence of hypoglycemia in the DCCT is that insulins used were less physiologic than the current insulin analogs. In addition, the increased hypoglycemia with the pump was cut in half as the trial progressed; suggesting that familiarity with management of tight glycemic control improved as the trial proceeded (Pickup & Keen, 2002).

References:

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